CLAIMS

1. A stabilised gain semiconductor optical amplifier including an active waveguide (1) comprising an amplification medium (2), extending in longitudinal (Z), lateral (X) and vertical (Y) directions, and coupled to a laser oscillation structure, characterised in that said laser oscillation structure comprises at least two resonant cavities (13, 14; 18, 19) extending in first (D1) and second (D2) directions which are different from the longitudinal direction (Z) of the active waveguide (1) and arranged in such a way as to permit the establishment of laser oscillations having at least two different relaxation oscillation frequencies.

2. An optical amplifier according to claim 1 characterised in that said resonant cavities (13, 14) have different optical path lengths.

3. An optical amplifier according to one of claims 1 and 2 characterised in that said resonant cavities (13, 14) are associated with different wavelengths.

4. An optical amplifier according to one of claims 1 to 3 characterised in that said resonant cavities (13, 14) and said active waveguide (1) share at least in part said amplification medium (2).

5. An optical amplifier according to one of claims 1 to 3 characterised in that said resonant cavities (13, 14) have first (D1) and second (D2) directions which are substantially parallel to each other and substantially perpendicular to said longitudinal direction (Z) and each share different portions of said amplification medium (2) of the active waveguide (1).

6. An optical amplifier according to one of claims 1 to 5 characterised in that one at least of said resonant cavities (13, 14) comprises a multi-mode interference amplification structure.

7. An optical amplifier according to one of claims 1 to 6 characterised in that said resonant cavities (13, 14) are defined by distributed Bragg reflectors.

8. An optical amplifier according to one of claims 1 to 7 characterised in that said resonant cavities (13, 14) are formed at least in a passive waveguide (4) which is placed

below said active waveguide (1) on respective sides of the longitudinal sides of said active waveguide (1).

9. An optical amplifier according to claim 1 characterised in that said resonant cavities (18, 19) are defined by a structuring formed along the longitudinal sides of the active waveguide (1), which are parallel to said longitudinal direction (Z), and having at least one forbidden photonic band comprising at least two different reflection directions (D1, D2) for a photon wavelength included in the amplification band of said active waveguide (1).

10. An optical amplifier according to claim 9 characterised in that said structuring (18, 19) is produced at least in part in an upper layer (3) in which said active waveguide (1) is buried and in a passive waveguide (4), along the longitudinal edges of said active waveguide (1).

11. An optical amplifier according to claim 9 characterised in that said structuring (18, 19) is produced in said active waveguide (1) on respective sides of its longitudinal axis and in a part at least of an upper layer (3) which is placed above said active waveguide (1) and in a passive waveguide (4), placed below said active waveguide (1).

12. An optical amplifier according to one of claims 9 to 11 characterised in that said structuring (18, 19) defines substantially a photonic crystal of holes (20) or columns constituting diffracting elements and defining a mesh of the order of the wavelength of the photons in the guided mode flowing in said active waveguide.

13. An optical amplifier according to claim 12 in combination with one of claims 10 and 11 characterised in that said holes (20) or columns extend substantially parallel to said vertical direction (Y) of the active waveguide (1).

14. An optical amplifier according to one of claims 12 and 13 characterised in that said photonic crystal is a paving arrangement of substantially contiguous convex polygons and share each of their edges with a single adjacent one.